AMENDMENTS TO THE CLAIMS

Please replace all previous versions of the claims with the following listing:

1. (Canceled).

2. (Previously presented) The device according to claim 12, wherein the heat exchanger is the evaporator.

3. (Previously presented) The device according to claim 12, wherein the heat exchanger is the condenser.

4. (Previously presented) The device according to claim 12, wherein the means for determining the first rate of heat flow establishes a heat exchange fluid mass flow and a specific enthalpy change of the heat exchange fluid across the heat exchanger.

5. (Previously presented) The device according to claim 4, wherein the means for determining the first rate of heat flow establishes the heat exchange fluid mass flow as a constant based on empirical data or based on data obtained under faultless operation of the system.

6. (Previously presented) The device according to claim 4, wherein the means for determining the first rate of heat flow comprises means for sensing heat exchange fluid temperature before and after the heat exchanger.

7. (Currently amended) The device according to claim 12, wherein the means for determining the second rate of heat flow establishes [[a]] <u>the</u> refrigerant mass flow and a specific enthalpy change of the refrigerant across the heat exchanger.

8. (Currently amended) The device according to claim 12, wherein the means for determining the second rate of heat flow establishes the refrigerant

mass flow based on [[a]] the flow characteristic of the expansion device, and the expansion device opening passage and/or opening period, and an absolute pressure before and after the expansion device, without measuring subcooling of the refrigerant at the expansion device entry.

9. (Currently amended) The device according to claim 12, wherein the means for determining the second rate of heat flow establishes the specific enthalpy difference of the refrigerant flow based on registering the pressure of the refrigerant at the expansion device entry and the refrigerant evaporator exit pressure or the saturation temperature of the refrigerant at the evaporator inlet.

10. (Previously presented) The device according to claim 12, wherein the residual is derived as a difference between the first rate of heat flow and the second rate of heat flow.

11. (Previously presented) The device according to claim 10, wherein the evaluation means evaluates the refrigerant mass flow by means of a fault indicator $S_{\mu_1,i}$ provided according to the formula:

$$S_{\mu_1,i} = \begin{cases} S_{\mu_1,i-1} + s_{\mu_i}, \textit{when } S_{\mu_1,i-1} + s_{\mu_1,i} > 0 \\ 0, \textit{when } S_{\mu_1,i-1} + s_{\mu_1,i} \le 0 \end{cases}$$

where $s_{\mu_1,i}$ is calculated according to the following equation:

$$s_{\mu_1,i} = -k_1\left(r_i - \frac{\mu_0 + \mu_1}{2}\right)$$

where
r_i: residual
k_1: proportionality constant
μ_0: first sensibility value
μ_1: second sensibility value.

12. (Currently amended) A flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a

condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises:

means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for establishing an energy balance from which a residual for monitoring the refrigerant mass flow is derived; and

evaluation means for evaluating the refrigerant mass flow, and providing an output signal indicating the presence or absence of flash gas, based on the residual,

wherein the means for determining the second rate of heat flow uses inputs from means for sensing absolute refrigerant pressure before and after the expansion device, means for establishing an opening passage or opening period of the expansion device, and means for storing a value representing a flow characteristic of the expansion device, without requiring measurement of refrigerant temperature at the expansion device entry and exit.

13. (Previously presented) The device according to claim 12, wherein the means for determining the first rate of heat flow comprise means for sensing heat exchange fluid temperature before and after a heat exchanger.

14. (Currently amended) The device according to claim 11, wherein the evaluation means provides the output signal indicating the presence or absence of flash gas according to the formula:

$$output\_signal = \begin{cases} \text{PRESENT, when the fault indicator } S_{\mu_1,i} > \text{a predetermined value;} \\ \text{ABSENT, otherwise.} \end{cases}$$

15. (Previously presented) The device according to claim 12, wherein the means for determining the second rate of heat flow establishes the refrigerant heat flow according to the equation:

$$\dot{Q}_{ref} = k_{\exp}\left(P_{con} - P_{ref,out}\right) \times OP \times \left(h_{ref,out} - h_{ref,in}\right)$$

where

$\dot{Q}_{ref}$ is the second rate of heat flow;

k_{exp}: proportionality constant representing the flow characteristic of the expansion device;

P_{con}: refrigerant pressure in the condenser;

$P_{ref,\,out}$: refrigerant pressure at the evaporator exit;

OP: opening period or opening passage of the expansion device;

$h_{ref,\,out}$: refrigerant enthalpy at the evaporator exit, based on $P_{ref,out}$; and

$h_{ref,in}$: refrigerant enthalpy at the evaporator entry, based on $P_{ref,out}$.

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16. (Previously presented) The device according to claim 12, wherein the evaluation means comprises means for deriving the residual as a difference between a first value, which is made up of the mass flow of the heat exchange fluid flow and the specific enthalpy change across the heat exchanger , and a second value, which is made up of the mass flow and the specific enthalpy change of the refrigerant across the heat exchanger .

17. (Previously presented) The device according to claim 12, wherein the device further comprises memory means for storing the output signal and means for comparing said output signal with a previously stored output signal.

18. (Currently amended) The device according to claim 12, further comprising means for activating an alarm based on the output signal indicating presence of the flash gas.

19. (Currently amended) A flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises:

means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for

establishing an energy balance from which a residual for monitoring the refrigerant mass flow is derived; and

evaluation means for evaluating the refrigerant mass flow, and providing an output signal indicating the presence or absence of flash gas, based on the residual,

wherein the means for determining the second rate of heat flow uses inputs from means for sensing absolute refrigerant pressure before and after the expansion device, means for establishing an opening passage or opening period of the expansion device, and means for storing a value representing a flow characteristic of the expansion device, and determines the refrigerant mass flow according to the equation:

$$\dot{m}_{ref} = k_{\exp} \cdot \left(P_{con} - P_{ref,out}\right) \cdot OP$$

where

$\dot{m}_{ref}$: refrigerant mass flow

$k_{\exp}$: value representing the flow characteristic of the expansion device

P_{con}: absolute refrigerant pressure before the expansion device

$P_{ref,out}$: absolute refrigerant pressure after the expansion device

OP: opening passage or opening period of the expansion device,

without requiring measurement of refrigerant temperature at the expansion device entry and exit.

20. (Currently amended) A flash gas detection device for a vapour-compression refrigeration or heat pump system comprising a compressor, a condenser, an expansion device, and an evaporator interconnected by conduits providing a flow path for a refrigerant, wherein the device comprises:

means for determining a first rate of heat flow of a heat exchange fluid flow across a heat exchanger of the system and a second rate of heat flow of the refrigerant across the heat exchanger, and using the rates of heat flow for establishing an energy balance from which a residual for monitoring the refrigerant mass flow is derived; and

evaluation means for evaluating the refrigerant mass flow, and providing an output signal indicating the presence or absence of flash gas, based on the residual,

wherein the means for determining the second rate of heat flow uses inputs from means for sensing absolute refrigerant pressure before and after the expansion device, means for establishing an opening passage or opening period of the expansion device, and means for storing a value representing a flow characteristic of the expansion device, and the evaluation means provides the output signal indicating the presence of the flash gas in case the time average of the residual is less than zero.